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and gases (or vapors) and which are characterized by a negative temperature coefficient in a certain temperature range. In a number of cases, there was observed a critical temperature above which the reaction would not take place. The authors proposed that this type of reaction is based on the formation of intermediate products which decompose as the temperature is increased.

"Kinetic Characteristics of Certain Oxidation Reactions in Mixtures Which Are Subjected to Cooling," by N. M. Emanuel', Candidate in Chemical Sciences. On the example of the oxidation of hydrogen sulfide, Emanuel' established an abrupt change in the kinetic behavior of the reaction after it was conducted repeatedly in a mixture subjected to chilling. The author discovered the appearance of a contraction, which reflected the conversion of the intermediate product SO into the dimer form  $S_2O_2$  on cooling. These observations were supported by spectroscopic measurements. Also, in the case of the oxidation of aldehydes (acetic, propionic, and butyric), kinetic differences were established between reaction in fresh and in chilled mixtures, due to the conversion of intermediate hydroperoxides into stable forms. This corresponds with the earlier ideas of Academician A. N. Bakh, and has been confirmed by diverse experiments.

"Heterogeneous Catalysis in the Polymolecular Adsorption Region," by N. M. Chirkov. This paper reported the results of kinetic investigation of the esterification, hydrolysis, and depolymerization of paracetaldehyde under the catalytic action of acids. The reactions are proven to be heterogeneous with an ionic mechanism. The exponential character of the dependence of reaction rate on pressure, in conjunction with data from special investigations on adsorption and surface electrical conductivity, shows that chemical conversion proceeds in an adsorbed film of considerable thickness; catalysis is accomplished by ions formed in the polymolecular film just as in an ordinary liquid. The report cited a number of facts which point to the possibility of an ionic mechanism in the monomolecular adsorption region. All the facts are in agreement with Academician N. N. Semenov's ideas concerning the ionic mechanism of a number of heterogeneous reactions.

#### Conference of Young Scientists

The Institute of Physical Chemistry conducted a conference of young scientists at which 14 reports, summarized below, were delivered, characterizing almost all the directions in which the work of the institute is proceeding.

"Methods for Determining the Type of Inhomogeneity of a Surface From Experimental Data on the Kinetics of Catalytic Processes," by V. I. Levin. The author developed general equations for the kinetics of catalytic reactions, as well as the conditions which must be satisfied in an experiment for determining the distribution of sections of the surface according to activity. Having analyzed the different methods for the mathematical treatment of experimental data and having cited appropriate examples, the author touched on the functions of distribution of sections of the surface of zinc oxide with respect to the activation energies of the decomposition of methanol. He gave possible explanations of the physical nature of surface inhomogeneity in relation to catalytic activity.

"Investigation of the Connection Between Catalytic Activity and the Structure of the Catalyst," by Yu. Sh. Moshkovskiy. This report gave a comparison between the catalytic activity of a smoke film of zinc oxide and that of the usual zinc-oxide preparation produced by the pyrolytic decomposition of the carbonate. The structure was studied with an electron microscope. Catalytic activity was determined both in a static vacuum apparatus and in a dynamic apparatus. The activity of the smoke-film catalyst was five times greater than that of the usual preparation. The result agrees with S. Z. Roginskiy's theory of supersaturation.

- 2 -

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50X1-HUM

"Study of the Surface Changes of a Catalyst in Operation by the Replica Method," by I. I. Tret'yakov. Palladium and silver plates were used as catalysts for the oxidation of hydrogen and ethylene. The electron-microscope method (by preparation of colloidal "shaded" films), which was checked on a number of objects, was employed. "Before" and "after" exposures of the palladium and silver plates show the faults created on the surface by the reaction. A comparison of statistical data giving dimensions and distances between faults with data calculated on the basis of the law of probability provides evidence of the existence of a rule governing the distribution of faults.

"Ratio Between Oxygen and Hydrogen Depolarization of Aluminum and Its Alloys," by T. V. Matveyeva. This paper gave results of investigation of the corrosion of certain metals and alloys. The purpose was to clarify the dependence of the ratio between the velocities of oxygen and hydrogen depolarization and of their absolute velocities on the character of the alloy and the conditions for operation of the corrosion process. On the basis of gas-volumetric determinations, the methods and apparatus were worked out for determining the kinetics of oxygen and hydrogen depolarization where they take place jointly in the corrosion process.

"The Structure of the Faces of Growing Silver Crystals From the Data of Microinterference Measurements," by T. V. Ivanovskiy. Through investigations using interference diagrams it was shown that the observed change in the form and relative size of the faces of growing crystals results from distortion of elementary growth layers. This deformation is explained by peculiarities in the distribution of material supply near the face of the crystal, by the formation of convection currents, and by the development of complex diffusion fields. Observations carried out on small crystals accord with the author's view that the irregularities in feeding of crystallizing material to different sections of the face increase as the crystal size increases.

"Elastoplastic Properties of Clay Suspensions," by R. G. Litvinova. Using the method of a tangentially displaceable plate (on the Veyler-Rebinder apparatus), three types of deformation produced in clay suspensions were distinguished; the applicability of simple mechanical models with elastic reaction to thixotropic suspensions of bentonite clays was shown, and the elements of these models were calculated. The relaxation of tension after constant deformation was measured and the effect of partial or total replacement of the aqueous medium with butylene glycol, leading to the development of elasticity in the clay suspensions, was investigated.

"Surface and Volume Chemical Reactions Where Calcium Oxide Solutions React With Silica Gel and Alumina Gel," by K. G. Krasil'nikov. When calcium oxide is taken up (extremely slowly) from aqueous solutions by silica gel, the equilibrium ~~state~~ sorption kinetics isotherms for short time intervals is characterized by a large straight-line section perpendicular to the concentration axis, showing that a new volume solid phase, calcium monosilicate, is formed. The equilibrium concentration of calcium oxide which corresponds to this compound is 3.2 mg/l. At higher molar ratios, the isotherms show two points of inflexion, indicating the possible formation in this system of other compounds whose molar ratio  $\text{CaO}:\text{SiO}_2$  is greater than unity. The equilibrium isotherm for the sorption of calcium oxide from aqueous solutions by alumina gel is distinguished by a vertical section, proving the formation of a new surface phase, calcium aluminate. At increased concentrations of calcium oxide, a volume chemical compound formed, although no equilibrium was yet reached. It was emphasized that the study of chemisorption processes in this case approaches the field of volume phase equilibria, and the study of new surface phases is the next task for investigators.

- 3 -

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"Investigation of the Phenomenon of Adhesion of Fine Filaments in Liquid Media in Order to Duplicate Experimentally the Interaction Between Particles of Hydrosols." by A. D. Malkina

This paper was devoted to the theory of the phenomenon and the application of relationships pertaining to forces of adhesion. Malkina worked out methods for accurate measurement of the force of adhesion between quartz filaments in liquid media. A new phenomenon of the continuous kinetics of adhesion between quartz filaments was discovered. Hydrodynamic calculations showed that the stage in which the liquid is squeezed out of the interfilament gap is completed in a fraction of a second, and that the gap between the surfaces reaches a thickness of 1-2 molecules. In this case, the usual hydrodynamic phenomena connected with viscosity lose their role, their place being taken by molecular phenomena.

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"Determination of the Values of Specific Surface of Porous Adsorbents," by N. N. Milos. This report examined the assumptions on which are based methods for the determination of the specific surface of adsorbents and the surface of the adsorption layer from isotherms of adsorption of vapors. It was shown that the value of the specific surface of roughly and uniformly porous adsorbents can be established with accuracy of within 10-20%, while in the case of finely porous adsorbents the value cannot be determined.

"Passivation of Iron With Gaseous Oxygen," by N. A. Shumilova. This paper represented a study of the kinetics of the oxidation of iron by gaseous oxygen and of the effect of adsorbed oxygen on the electrochemical behavior of an iron electrode in KOH solutions. It was shown that the limiting thickness of the oxide boundary varies with temperature. A new method, worked out for determining the value of the true surface of iron by the quantity of activated and adsorbed oxygen, aided in measurement of the thickness of oxide films formed on iron in the temperature range of 90-473° K. Adsorption-kinetics findings in conjunction with electrochemical data make it possible to discern the principal difference between the mechanism of the passivation of iron with gaseous oxygen and that of electrochemical passivation. Thus, for the first time, the activating effect of small admixtures of oxygen in dilute KOH solutions on an iron electrode has been established.

"Study of the Polarization Capacity of a Rhodium Electrode," by A. F. Lunev. [No further information is given on this report.]

"Behavior of an Aluminum Electrode in Alkalis Under Cathodic Polarization," by A. I. Zak. The author presented a report on the detection of the phenomenon of superactivation, which grows as the cathodic current density increases. It was established that the velocity of spontaneous solution of aluminum depends on the nature of the alkali metal cation and the current density, having no connection with the concentration of alkali or evolution of heat from the solution. The author suggested that this phenomenon is caused by the adsorption of alkali metal ions or to the formation of a surface alloy between aluminum and the alkali metal.

"Effect of Surface-Active Substances on the Polarization Capacity of the Mercury Electrode," by V. I. Melik Gaykazyan. To study the kinetics of adsorption of surface-active substances on the surface of a mercury electrode, the author measured the capacitance of the electric binary layer with a current of varying frequency. The investigations established that the dispersion in values of capacitance resulting from a change of frequency characterized the velocity of the process taking place at the electrode. From an examination of the dispersion in the cases of pure solutions and solutions with admixtures of alcohols with different chain length of molecules, it was concluded that the change in capacitance was attributable to the differing penetration of the ions forming the binary layer between molecules of alcohol adsorbed on the electrode.

- 4 -

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A. N. Frumkin, concluding the conference, emphasized its importance as a review of independent research carried out by young scientific workers at the institute.

Award of the Prize imeni A. N. Bakh

On 3 May 1948, the Scientific Council of the Physicochemical Institute imeni L. Ya. Karpov awarded the Prize imeni A. N. Bakh for the best work in physical chemistry to N. M. Emanuel', director of the Laboratory of Intermediate Products, Institute of Chemical Physics, Academy of Sciences USSR, for research work in the field of intermediate products of gaseous oxidation reactions.

Emanuel', in research carried out in 1940 - 1948, developed A. N. Bakh's peroxide theory of oxidation reactions. Such research represents a real contribution to chemical kinetics and to the study of chain reactions and elementary processes. In particular, it continues the investigations of prominent Soviet scientists -- such as Academician N. N. Semenov; V. N. Kondrat'yev, Corresponding Member of Academy of Sciences USSR, and S. S. Medvedev -- in the field of chemical kinetics.

Emanuel' has devoted his investigations to the oxidation of hydrogen sulfide and a number of aldehydes. He has devised a new method for studying the properties and reactions of free radicals and other unstable intermediate products, i.e., the kinetic method, which is based on determination of the concentration of radicals on the basis of the reaction kinetics under given conditions, and which makes it very simple to obtain entirely specific information on the true mechanism of the chemical process and on the nature of the active centers which induce this process.

Using the kinetic method together with a number of other experimental procedures, Emanuel' succeeded in clarifying a series of interesting data on the mechanism of oxidation reactions (cf. Vestnik Akademii Nauk SSSR, No 3, 1948, p 119). The results and new procedures for kinetic investigations which have been introduced by Emanuel' are of general interest in connection with the kinetics of gaseous reactions. The award of the Prize imeni A. N. Bakh to N. M. Emanuel' testifies to the wide recognition accorded to the work of Academician N. N. Semenov's school of chemical kinetics.

Emanuel's report on the research for which he won the prize was the subject of the second Bakh Lecture held 13 May 1948, which was heard with great interest.

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- 5 -

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